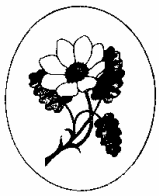
Fig. 89 *Cladosporium* infection of *Dactylorhiza foliosa* and *D. foliosa x majalis* (p.168)
(Photo: Brian Wilson)

Cladosporium orchidis
- a fungal pathogen causing leaf disease in *Dactylorhiza*



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DACTYLORHIZAS make desirable garden plants and are widely grown by club members in Scotland where many do exceptionally well. In recent years, in common with many other growers, we have observed an increasing incidence of dark brown spotting on the leaves relatively early in the growing season, leading to premature senescence of the plant. The spots usually start small, are often irregularly lens shaped, aligned with the length of the leaf and may be surrounded by yellowing tissue (fig. 89). The brown areas enlarge so that eventually the whole leaf goes brown, the stem collapses and the plant dies down to the ground. The appearance of the spots is that of a classic hypersensitive response to an infection. While initially the leaf damage does not usually kill the plants, the shortened period of growth means that the new storage roots are much smaller than normal and premature loss of the foliage in successive years weakens the plants so that they eventually fail to reappear in the spring. The condition seems worse if the plants start into early growth and are then subjected to frost and prolonged cold damp growing conditions. Some colleagues have reported dark spots on the storage roots which may also be truncated and lack the fine white hairs of healthy roots indicating infection by spores carried through the soil by rain. Infected roots may rot prematurely. As a precaution some growers have destroyed their stocks of plants. There is no evidence that the infection is systemic as infected roots reportedly give rise to healthy offsets. There seems to be some variation in susceptibility of Dactylorhizas to the disease depending on the genetic background of the plants. Thus, in our experience *Dd. praeterissima* and *foliosa* and the Cruickshank form of *D. fuchsii* are badly affected. In one colony of hybrids only a few variant plants which are thought to be sports or seedlings of the original hybrid were damaged.

THE CAUSE

Examination of the brown areas showed they contain fungal hyphae which have been identified as *Cladosporium orchidis* - a member of a family of plant and animal pathogens. *C. orchidis* is a known pathogen of orchids (Ellis and Ellis 1997) which occurs in the wild in the UK where it can be common on colonies of *Dd. fuchsii* and *majalis*. Like many fungal pathogens it probably enters the plant through local areas of damage and

senescing tissue such as those produced by frost. It is favoured by cool wet conditions. *Cladosporium* may also occur at times late in the season as the aerial parts of the plant die back for the winter. For those interested *Cladosporium* can be isolated on malt extract agar as olive colonies bearing greenish conidia. We do not know if *Cladosporium* infects other orchid genera but we have seen similar spotting on *Epipactis gigantea* and on *Orchis mascula* although we have not investigated these.

PREVENTION

Having identified the problem we now come to the speculative part, what are we going to do to save our Dactylorhizas next year? We would suggest the following strategy to reduce the extent of the disease. Like most plant diseases hygiene is a good place to start, thus cleaning up and destroying infected tissue and old leaves at the end of the growing season is essential. A clean mulch such as peat, sand, gravel or bark laid round the plants just before they start into growth should help to prevent overwintering spores being splashed onto the plants. Planting washed tubers into clean soil can also be tried.

Benzimidazole fungicides like Carbendazim applied at intervals early in the season should also help to control *Cladosporium* as should most other modern non-oomycete fungicides. For the amateur grower in the UK there are several fungicides suitable for use on ornamentals containing Carbendazim available in garden centres. There may be no recommendation on the label giving the frequency of application and dose for orchids but those suggested for fungal diseases such as *Botrytis* on ornamentals should be suitable. With most fungicides this equates to an application every two weeks in the early part of the growing season. As a precaution when treating new plants it might be wise to try spraying only a few plants initially to ensure that spray damage does not occur. Orchid leaves can be difficult to wet with sprays and the inclusion of a few spots of washing-up liquid as a wetting agent will help to ensure the leaves are thoroughly wetted by the fungicide. While these modern fungicides are to some extent systemic, a good coverage and wetting particularly of the underside of the leaves will ensure good penetration of the active ingredient. To reduce damage to the mycorrhiza (beneficial fungi) which are associated with orchid roots a wise precaution will be to protect the soil round the plants as much as possible and to spray upwards to reduce the quantity of spray reaching the soil. Because of the effect on the mycorrhiza we are not certain if dipping infected roots in fungicide and replanting them in clean soil will be beneficial.

In our experience physical protection of the plants in the early part of the year can also help prevent *Cladosporium*. Dactylorhizas grown in pots in the greenhouse and plunged outside when the danger of frosts is over seem to be free of *Cladosporium* infection. This treatment also improves the growth of young plants as their growing season is lengthened and they produce better

storage roots by the end of the season.

PROGNOSIS

Cladosporium will always be in the environment and harmless infections may well occur most autumns during senescence. It has probably become a major problem earlier in the season because of a succession of years when we have had very mild periods in February and March followed by occasional sharp frosts and a cold wet cold spring lasting until July. Our experience is that Dactylorhiza colonies which have been infected in the last two years were previously fully hardy and disease free. Since we have only just identified the problem we hope that by adopting the precautions suggested above we can return to enjoying disease free orchids of former years.

FOOTNOTE

At the time of writing we have not yet been able to try all of the precautions suggested above. Neither the authors nor the Scottish Rock Garden Club can accept responsibility for a failure of, or any damage resulting from the treatments suggested which are given in good faith.

STOP PRESS: *It is now late April and we have carried out many of the suggested measures and as an additional precaution covered the emerging plants with a plastic sheet set on bricks to keep the rain off. To date our plants are disease free. We will never know if this is due to the precautions taken or to the more normal winter/spring weather we have experienced since last summer .*

ACKNOWLEDGEMENTS

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REFERENCE

Ellis, M. B. and Ellis, J. P. (1997) *Microfungi on Land Plants: an identification handbook.* 2nd Edition Richmond Publishing, Slough.
